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Trauma video review utilization: A survey of practice in the United States[★]

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Abstract

Introduction: Trauma video review (TVR) for quality improvement and education in the United States has been described for nearly three decades. The most recent information on this practice indicated a declining prevalence. We hypothesized that TVR utilization has increased since most recent estimates.

Methods: We conducted a survey of TVR practices at level I and level II US trauma centers. We distributed an electronic survey covering past, current, and future TVR utilization to the Eastern Association for the Surgery of Trauma membership.

Results: 45.0% of US level I and level II trauma centers completed surveys. 71/249 centers (28.5%) had active TVR programs. The use of TVR did not differ between level I and level II centers (28.8% vs. 27.8%, $p = 0.87$). Respondents using TVR were overwhelmingly positive about its perception (median score 8, [IQR 6–9]; 10 = ‘best’) at their institutions.

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Author contributions

Dumas RP participated in study design, data collection, data analysis and writing of the manuscript. Vella MA participated writing of the manuscript, data collection and study design. Hatchimonji J participated in study design, data collection and review of the manuscript. Ma L, participated in data collection. Maher Z, participated in study design. Holena DN participate in study design, data collection, data analysis and writing of the manuscript.

Conflicts of interest and source of funding

No authors have conflicts to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amjsurg.2019.08.025>.

Conclusions: TVR use at Level I centers has increased over the past decade. Increased TVR utilization may form the basis for multicenter studies comparing processes of care during trauma resuscitation.

Keywords

Trauma video review; Education; Quality improvement; Medicolegal

Introduction

Video review for medical education has been used across various disciplines from anesthesia to psychiatry and across all levels of training.¹ The use of videotaping and ensuing review was studied in the surgical field as early as the 1960s² and was further subsequently used to correlate technical performance with surgeon vital signs.^{2,3} Hoyt et al. described the first use of trauma video review (TVR) as a quality improvement tool in 1988. They recorded over 2500 resuscitations with a portable TV stand on which a VCR, camera and TV were mounted and demonstrated a reduction in time to definitive care by a treatment team actively participating in a regular video review conference.¹ Subsequent work has validated TVR as an important educational and research tool in addition to its value in performance improvement. Current technology allows for the simultaneous audio and visual recording of trauma resuscitations from multiple positions as well as the visualization of patient monitors and ultrasound/video laryngoscope screens. Videos can be stored and played back at a later date for multipurpose review, during which time the recording can be paused, rewinded, or fast-forwarded (Fig. 1).⁴ Despite these benefits, the use of TVR has historically been low. Ellis et al. surveyed centers across several states in 1999 and found that only 20% were using TVR.⁵ More recent studies suggest a declining prevalence at level I centers despite 100% of respondents in one study finding the technology to be beneficial.^{6,7}

It has been nearly a decade since adult trauma centers were last surveyed on TVR use. As such, current utilization among US trauma centers remains largely unknown. We sought to characterize the use of TVR at level I and II trauma centers and hypothesized that improvements in technology, increased accessibility, and an enlarging body of literature reporting benefits of TVR have resulted in increased TVR utilization.

Methods

We conducted a national survey of TVR practices at level I and level II (defined as highest state or American College of Surgeons designation) United States trauma centers listed in the American Trauma Society's (ATS) 2017 Trauma Information Exchange Program (TIEP). The TIEP "maintains an inventory of trauma centers in the U.S., collects data and develops information related to the causes, treatment and outcomes of injury, and facilitates the exchange of information among trauma care institutions, care providers, researchers, payers and policy makers." (<https://www.amtrauma.org/page/TIEP?&hhsearchterms=%22tiep%22>). The ATS provides the TIEP data free of charge upon request. We designed and created a survey instrument using the **Research Electronic Data Capture** (REDCap) web-based tool⁸ (see supplement). We then piloted this instrument internally in a small cohort of attending

trauma surgeons and trauma fellowship trainees to ensure ease of use and completeness. We subsequently applied for distribution through the Eastern Association for the Surgery of Trauma (EAST) membership by submitting the survey for review to the EAST Research Committee. After vetting and peer review within the organization, we distributed the electronic survey covering past, current, and future TVR utilization and processes once weekly for a total of three weeks. To incentivize participation, we offered survey participants the chance to win an Apple iWatch 3 or value equivalent. Participation in the survey was voluntary and consent to participate was implied by completion of the survey. To achieve our goal response rate of >80% of all level I centers in the United States, investigators (RD, MV, JH, DH) reached out to non-responders personally via an email to request participation, because we reached out to non-responding centers directly these respondents may or may not have been EAST members.

In the event that multiple survey responses were received from a single center, we collapsed survey responses to the level of the center. We used chi squared test to test for differences in categorical variables and Mann-Whitney *U* test to test for differences in continuous variables that were not normally distributed. We used Stata v 15.0 (College Station, TX) for all statistical testing.

Results

In total, 249/553 (45.0%) of US level I and level II trauma centers completed surveys. Response rates differed between level I and level II centers (177/216 (81.9%) vs. 72/337 (21.4%), $p < 0.001$). Of the responding centers, 56% were either former users 18/249 (7.2%), current users 71/249 (28.5%), or planning to use TVR in the future 51/249 (20.5%). 109/249 (44%) centers were non-users that never had a program in the past and did not have plans to start a program in the future (Table 1).

Of responding centers, 71/249 (28.5%) had active TVR programs. The use of TVR did not differ between level I and level II centers (28.8% vs. 27.8%, $p = 0.87$). Nearly 20% (19.4%) of centers using TVR have been using it for less than 5 years. Of centers using TVR, the majority use continuously recording technology (54.9%), record all resuscitations (73%), and store the videos for less than one month (54.9%). The majority of centers review less than 50% of total resuscitations. 49% of centers using TVR consent their patients as part of a broad consent for treatment, while only a small minority (6%) specifically consent patients for TVR. 30% of centers do not consent their patients.

Respondents using TVR were overwhelmingly positive about its perception (median score 8, IQR 6–9) at their institution and reported high reliability (median score 8, IQR 6–9), 10=‘best’.

62% of users reported that the use of TVR at their center led to performance improvement initiatives and 41% of users reported it has changed institutional practice guidelines.

The most frequently reported use of TVR was for individual provider counseling/education (69%), followed closely by group education (59%). The majority of users agreed that the

most important characteristic of a resuscitation to highlight during video review was team communication.

Of current users, 6/71 (8.5%) respondents reported a medicolegal issue with TVR at their institution (defined as administrative pushback, challenges with the consent process, or any *perceived* concern), but only 2 (2.8%) of centers reported having direct knowledge of a medicolegal case involving TVR.

For the 51/178 (28.7%) of centers not currently using TVR but planning to do so in the future, the most important perceived barriers were medicolegal (median score, 5 IQR3–5) followed by staff resistance (median score, 4 IQR 3–5) and time/resource constraints (median score 3, IQR2–4).

For the 18/178 (10%) centers previously, but no longer using TVR, the most important reasons cited for ceasing the TVR program were medicolegal concerns (median score 5, IQR 3–5), insufficient time (median score 3.5, IQR 2–5), and financial issues (median score 3, IQR 2–4).

For centers not currently using TVR and not planning to the in the future, the greatest concerns were medicolegal (median 5, IQR 3–5) (Table 2).

Discussion

Using a nationwide survey of the largest professional society for acute care surgeons in the United States (EAST), this study attempted to quantify trauma video review use across US level I and level II trauma centers. While overall use of trauma video review has increased since 2010, TVR is still only used at about 30% of US centers. Use among level I centers is less than when studied 20 years ago. Additionally, we found that current users continue to report high satisfaction with TVR, while medicolegal and patient privacy concerns remain consistent barriers to implementation despite few reports of actual legal cases. To our knowledge, this is the first study evaluating TVR practices in adult patient since 2010.

Video review for performance and quality improvement has been utilized since the 1960s, when it was first described as a tool for teaching surgical techniques and emergency medical care.⁹ Since that time, the technology has found a role in educational, performance improvement, and research initiatives. These activities range from improving performance in airway management,^{10,11} evaluating compliance with barrier precautions,¹² identifying errors in resuscitation,¹³ timing procedures like emergency department thoracotomy and intraosseous access,^{14,15} evaluating the effect of team leadership on process of care,^{16–19} and characterizing the non-technical elements of resuscitations and rapid changes in patient condition that are difficult to extrapolate from a medical record.⁴ In many of these capacities, TVR has been shown to be more reliable than chart review in characterizing and detecting errors in resuscitation^{4,14,20,21} and may be more effective than verbal feedback when used as an educational and performance improvement tool.²² In one study that characterized TVR use, centers reported using the technology most commonly for resuscitation and education purposes (92%), quality assurance (83%), research (12%), and answering specific clinical questions (8%).⁶ This is similar to our

results in which respondents reported using the technology primarily for quality and performance improvement initiatives and changes in institutional protocols.

Despite these perceived benefits, overall use of TVR among trauma centers in the current study is low. Only 29% and 28% of responding level I and level II centers respectively, report active TVR programs. In the first major study of TVR practices among US trauma centers in 1999, Ellis et al.⁵ surveyed 221 institutions (the majority level I) in the ten most densely populated US states. The authors found that, overall, 20% of centers were using TVR at the time, including 34% of level I centers. Ten percent of centers reported stopping a previously active program. Around the time of this study was the implementation of the Health Information Portability and Accountability Act (HIPAA) of 1996, which introduced medicolegal and patient privacy concerns surrounding the use of TVR.²³ While HIPAA establishes national standards for the protection of health information, hospital administrations have continued difficulty interpreting and applying the law. HIPAA allows for the use of data collection, research initiatives and performance and quality improvement programs. HIPAA does not, however, specifically address the use of video graphic patient information which likely contributed to the varying consent practices that we observed in our survey (<https://www.hhs.gov/hipaa/for-professionals/privacy/laws-regulations/index.html>). To evaluate the effects of HIPAA on TVR use, Campbell, et al.⁶ evaluated practices at 125 level I centers in 2006. They found that 18% of centers were using TVR at that time, a decrease in 16% compared with 7 years prior. Thirty-five percent of responding centers reported that HIPAA affected their TVR practices in some capacity, and, along with scare resources, was the most commonly cited reason for stopping an active program.

More recently, Rogers et al.⁷ surveyed 102 American College of Surgeons verified adult level I and pediatric level I and II trauma centers to evaluate changes in TVR practices. In that 2010 study, 20% of centers reported using TVR, including 18% of adult level I centers. The results of these past studies, taken together with our findings, suggest that, while the overall utilization of TVR is increasing (including an 11% increase at level I centers over the last 9 years), use remains lower than in the pre-HIPAA era when studied 20 years ago. Supporting the idea that overall use is increasing is our finding that only 7% of responding centers report stopping a previously active program, compared with 40% and 37% when studied in 2010 and 2006, respectively. Although the surveyed populations are not identical, these results suggest that some previous users have restarted TVR programs. Fortunately, 20% of responding centers in the current study report plans to start an active TVR program in the future, compared with 9% of centers who reported plans to start an active TVR program when surveyed in 2010.⁷

In the current study, overall perception of TVR was positive, with median scores of 8 (on a 10-point Likert scale) in the domains of perception and reliability. This has been consistent over time, with respondents in the study by Campbell et al.⁶ reporting a mean score of 3.8 (on a 5-Point Likert scale) for “enthusiasm” for the technology and 100% of respondents in the 2010 Rogers et al.⁷ study reporting that TVR has improved their resuscitation processes. Nearly two-thirds of respondents in our current cohort reported that TVR led to performance improvement initiatives at the institutional level.

We found that the most important barriers to TVR implementation were medicolegal concerns, staff concerns, and time/resource constraints. For past users and non-users, medicolegal concerns were paramount, which could explain their rationale for either stopping TVR use or deciding not to pursue an active TVR program. Only 9% of centers reported experience with a “medicolegal issue” involving TVR, which we defined as administrative pushback, challenges with the consent process, or any *perceived* concern. 2 (3%) responding centers reported knowledge of an actual medicolegal case involving TVR. The discrepancy between actual and perceived medicolegal/patient privacy concerns has been borne out in previous work. In the 1999 study by Ellis et al.,⁵ 34% of non-user centers cited perceived medicolegal concerns and 22% cited patient confidentiality concerns related to the TVR process, possibly explaining why 60% of non-users reported no plans for starting a TVR program at that time. Nineteen percent of previous users reported medicolegal concerns as a perceived problem with TVR implementation. Interestingly, there were no reported medicolegal or patient privacy concerns by current users in that study, indicating that actual barriers faced by current users differed from those perceived by non-users. Similarly, Rogers, et al.⁷ found that 50% of non-users and 70% of past users in their study cited medicolegal and privacy concerns as perceived barriers and reasons for stopping active programs. The most commonly cited issue among active TVR programs, however, was “technical problems”. The majority (90%) of centers with active programs reported no issues with subpoenas, request for legal proceedings, TVR use in legal proceedings, or requests from law enforcement, parties in civil or criminal case, or other legal entities.

To mitigate these medicolegal and patient privacy concerns, active TVR programs can limit who has access to video recordings, how videos are stored, and the timing of video deletion. It is recommended that active TVR programs ensure that videos are only available to peer review committee members (or other approved entities) and that videos are reviewed only at approved venues (i.e. peer review meetings).²⁴ Prior studies on TVR use report that most centers delete videos within 30 days of recording, and essentially all centers delete within 60 days, often through an auto-deletion process.^{4,5,7} Fifty-eight percent of centers in the current study report storing videos for less than 30 days. Concerns related to the medicolegal aspects of the consent process can be mitigated by including consent in the general hospital consent process as well as signage in areas where recording takes place.^{4,9} Studies have shown that up to 80% of TVR institutions obtain some form of consent for videotaping, with upwards of 60% including verbiage in the general hospital consent, often obtained in a retrospective fashion.^{7,9} In the current study, 53% of centers report including TVR consent in the general hospital consent process, with only 6% specifically consenting for TVR recording. Consent may not be required if TVR is used for performance improvement activities and may be exempt from legal review in some states. Some have also argued that HIPAA regulations may not apply to activities related to provider education.²³

In the current study, staff concerns were also perceived as important by current and future users (median score 4[3–5] on 5-point Likert scale). Previous work by Davis et al.²⁵ found that video review can be associated with anxiety, especially among attending physicians. It is important that reasons for starting a TVR program are discussed with staff prior to implementation and that a stake-holder analysis is performed to identify potential barriers. While the authors strongly believe TVR should not be used as an arbitration tool, and that

group performance should be emphasized over any individual⁴ our data suggests that in reality most centers use TVR as a tool for individual feedback. While this certainly may have some educational benefit this may result in providers and staff feeling targeted. It is recommended that programs interested in starting a TVR program consent hospital legal counsel prior to implementation. In addition, consultation with a mature TVR program to understand how barriers were overcome may be beneficial.

We acknowledge the limitations of the study. Although the response rate for level I centers is 82%, the overall response rate is low. In addition, there is significant heterogeneity among centers in the study, and, for these reasons, results may not be generalizable across all institutions. Information about institutional TVR practices was determined from individual respondents, which is inherently subjective and may not reflect the attitudes of other trauma team members or institutions as a whole. In this study, we compare our results to those of previous studies but recognize that the surveyed populations are not identical.

Conclusions

Use of trauma video review has increased since 2010, but overall utilization among level I and II centers is low despite a growing body of literature supporting the benefits of the technology. Medicolegal and patient privacy concerns remain consistent barriers to TVR implementation among non-TVIR centers despite few reports of actual medicolegal cases by those actively using the technology. Fortunately, our results indicate that about 20% of current non-users plan on starting active TVR programs in the future. It is our hope that increased prevalence will lead to collaborative multi-institutional trials in the future.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Fig. 1. Foot-of-the-bed (A) and overhead (B) high-definition video recording cameras located in each resuscitation bay at our institution.

Table 1

Current TVR Utilization across Level I and II trauma centers in the United States.

	Current Users (n = 71)	Past Users (n = 18)	Future Users (n = 51)	Non-Users (n = 109)	n = 249
^a Level of Verification					
1	51 (28.9%)	16 (9.0%)	39 (22.0%)	71 (40.1%)	n = 177
2	20 (27.8%)	2 (2.7%)	12 (16.7%)	38 (52.8%)	n = 72

^aCertification may be determined at the state or national level.

TVR perceptions amongst current, past, future and nonuser trauma centers across the United States expressed as median [IQR] on a 5-point Likert Scale (1 = not important at all, 5 = very important).

Table 2

	Current Users (n = 71)	Past Users (n = 18)	Future Users (n = 51)	Non-Users (n = 109)
Staff concerns	4 [3–5]	2 [1–3]	4 [3–5]	2.5 [1.5–4]
Medicolegal	4 [2.5–5]	5 [3–5]	5 [3–5]	5 [3–5]
Financial/Administrative	2 [2–4]	3 [2–4]	3 [2–4]	3 [3–4]
Time/Resources constraints	4 [2.5–4]	3.5 [2–5]	3 [3–4]	4 [3–5]
Resident/faculty buy-in Ref.	4 [2–4]	2 [1–3]	3 [2–4]	3 [1.5–4]